Influence of AIB hormone on the rooting success of shea (*Vitelaria Paradoxa Gaernt*) stem cutings

Gnanglè P. Césaire[1*], **Y**asminath J. Follone Avaligbé[2*], Aliou Saîdou[2]
[2] Unité de Recherche sur la Gestion Durable des Sols et des Cultures (ISCM), Laboratoire des Sciences du Sol, Faculté des Sciences Agronomiques (FSA), Université d'Abomey-Calavi (UAC), 04 BP 1510 Cadjèhoun Cotonou, Bénin.
[1] Institut National des Recherches Agricoles du Bénin. 01 BP 988 RP, Cotonou 01, Bénin
Auteur correspondant : gnangle paulcesaire2016@gmail.com

Introduction

Grafting and cuttings are two promising vegetative propagation techniques for shea domestication. The survival rates of grafted plants (86.67%) are higher than those obtained by cuttings (26.9%). The rooting substrate has a significant influence on the rooting rate. Rice bran was found to be the best substrate compared to coconut fiber and sand. The survival rate of the cuttings also depends on the hormone used and the nature of the cutting used. Vegetative propagation could be the favorable option for shea propagation, as the seeds (nuts) are in competition between consumption and propagation.

Shea (Vitellaria paradoxa C. F Gaertn) is a woody species of the Guinean and Sudanese savannah zone. The range of the shea tree extends over nearly 1 million km² in 21 sub-Saharan countries with multiple uses (Naughton et al. 2015). However, the main product of this tree remains its oil, derived from its kernels, which is highly prized for medical, cosmetic, and food uses (Boffa 2015). The demand for shea nuts is constantly increasing and future forecasts show the same trend (Faostat, 2018). However, this situation is accompanied inversely with productivity and this due to the long regeneration time, the long period set to fruit and the aging of existing stands. This has necessitated research on various propagation techniques such as grafting, cuttings and stratification (Okao et al. 2016) to increase tree productivity. To address these constraints, vegetative propagation is necessary.

The present study was initiated and aims to investigate propagation by cuttings and grafting of shea tree, in order to promote its domestication in the near future.

Methods

Study environment

The cutting and grafting trials carried out within the framework of the present study were conducted in two communes (Parakou and Savè) of the central Benin cotton zone of 16,900 km² with a Sudano-Guinean type of climate with a tendency towards the Sudano-Sahelian type.

There are also leached soils with varying degrees of concretion, sandy soils, sandy-clay soils and black and hydromorphic soils in the valleys. Rainfall varies from 600 to 1400 mm spread over 80 to 110 days. Cereals and legumes are widely cultivated. Shea stands are also found in this zone.

Conduct of Cutting Trials

Cutting trials were conducted at the Agricultural Research Center (CRA-Centre) in Savè (Benin). The propagation device used to conduct the trial measured 2 m x 1 m x 0.6 m and was subdivided into 3 compartments. This wooden box was covered with a transparent polyethylene film of 1 mm thickness to maintain a moderate temperature, humidity and light intensity favorable for the best development of the cuttings. The cuttings used for the conduct of the trial were collected in the shea park of Savè on trees selected according to the level of productivity, health status and also the availability of twigs of the year during the installation of trials (Asseh et al. 2017).

The growth hormones used are: Indole butyric acid (IBA) at a concentration of 10000 ppm was used to accelerate the growth of cuttings and aloe vera gel. The cuttings were dipped in the hormone at 5 cm from the base for five seconds before being placed in the polyethylene propagator containing the rooting substrates. These substrates were carbonized rice bran, coconut fluff and conventional substrate (soil from the trial site). After planting, the cuttings were watered as needed. The trial lasted 120 days. The experimental design adopted was a 3-block split-plot where substrates are assigned to large plots and hormones to small plots. The total number of cuttings in the trial was 360 (3 substrates* 2 hormones*2 natural*3 replicates *10 cuttings). Observations were made on the budding period and the recovery rate of the cuttings.

Results and discussion

Cutting trials were carried out from 360 cuttings previously immersed in Indole Butyric Acid (IBA) or aloe vera on 3 different substrates (peat and mixed coconut fiber, carbonized rice bran and sand) under a split plot frame. Main Results: The vegetative propagation technique by shea cuttings is promising for shea domestication. The survival rate of cuttings is 27%. The type of substrate has a significant influence on the rooting rate. Rice bran was the best compared to coconut fiber and soil at the experiment site. Carbonized rice bran highly favored ($p<0.01$) the rooting of shea cuttings compared to other substrates. AIB was better than Aloe Vera. The survival rate of the cuttings is also a function of the hormone used and the nature of the cutting used. Future research could be oriented towards the in situ monitoring of Vitellaria paradoxa cuttings as a function of time.

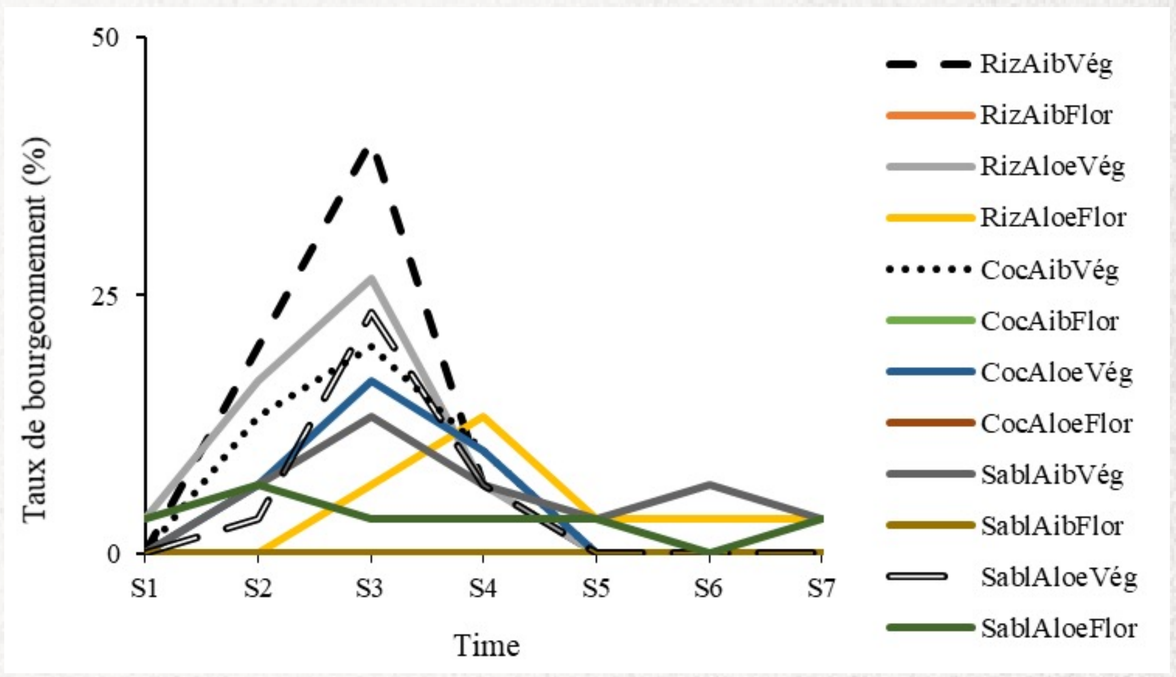

Figure 1: Evolution of the budding of *Vitellaria paradoxa* cuttings as a function of time

Legend. RiceAibVeg : Stem cutting with rice substrat and AIB hormone ; RiczzAibFlor : Floriferous cutting installed on carbonized rice bran with AIB hormone; RiceAloeVg : Vegetative cutting installed on carbonized rice bran with Aloe vera hormone; RiceAloeFlo : Floriferous cutting installed on carbonized rice bran with Aloe vera hormone; CocAibVég : Vegetative cutting installed on coconut husk with AIB hormone; CocAibFlo : Floriferous cutting installed on coco flock with AIB hormone; CocoAloeVeg : Vegetative cutting installed on coco flock with Aloe vera hormone; CocoAloeFlor : Floriferous cutting installed on coco flock with Aloe vera hormone; SandAibVég : Vegetative cutting installed on sand with AIB hormone; SandAibFlor : Floriferous cutting installed on sand with AIB hormone

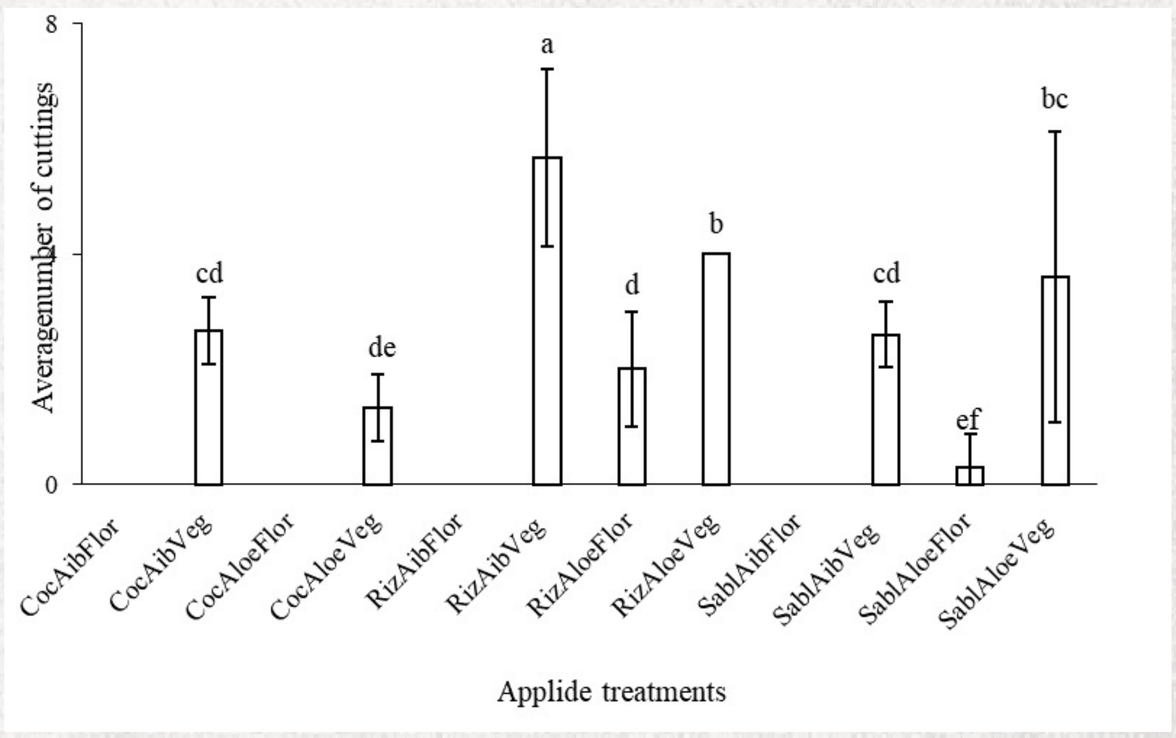

Figure 2: Influence of treatments used on the survival of cuttings

Conclusion

UGrafting and cuttings are two promising vegetative propagation techniques for shea domestication. The survival rates of grafted plants (86.67%) are higher than those obtained by cuttings (26.9%). The rooting substrate has a significant influence on the rooting rate. Rice bran was found to be the best substrate compared to coconut fiber and sand. The survival rate of the cuttings also depends on the hormone used and the nature of the cutting used. Vegetative propagation could be the favorable option for shea propagation, as the seeds (nuts) are in competition between consumption and propagation.

Key References

Okao M., Ogwal L., Mutoni G., Oyuko Alip S., Okullo J., Akais Okia C., 2016 - Effet du mode d'application de l'auxine sur l'enracinement et la cassure des bourgeons du karité (*Vitellaria paradoxa*) Boutures. Journal américain des sciences Okao M., Ogwal L., Mutoni G., Oyuko Alip S., Okullo J., Akais Okia C., 2016 - Effet du mode d'application de l'auxine sur l'enracinement et la cassure des bourgeons du karité (*Vitellaria paradoxa*) Boutures. Journal américain des sciences végétales, 7 : 2199-2208.

Yeboah, J., Lowor, S. T. Amoah, F. M. and Owusu-Ansah, F., 2010b - Influences of Selected Fungicide and Hormone on the Rooting success of Sheanut (*Vitellaria paradoxa* C.F. Gaertn) stem cuttings. Agriculture and Biology Journal of North America., 1(3): 313-320.

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